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New water mites of the family Hygrobatidae (Acari, Hydrachnidia) from Turkey

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Abstract

In this study, the findings of three water mite species of the family Hygrobatidae collected from different streams in Turkey were evaluated. *Hygrobates* (s. str.) *anatolicus* Esen & Pešić, **sp. n.** is described as new for science. *Hygrobates* (*Rivobates*) *diversiporus* Sokolow, 1927 and *Atractides* (s. str.) *nikooae* Pešić, 2004, which were illustrated and thoroughly discussed, are new records for the Turkish fauna.

Keywords

Acari, Hygrobatidae, water mites, new records, Turkey

Introduction

After the family Arrenuridae Thor, 1900, the Hygrobatidae Koch, 1842 is the most species-rich in Turkey. So far, 42 species have been found in Turkey (Erman et al. 2010, Esen et al. 2013) belonging to the genera *Atractides* Koch, 1837 (31 species), *Hygrobates* Koch, 1837 (9 species) and *Mixobates* Thor, 1905 (2 species).

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During a survey of the freshwater fauna of Kahramanmaraş, Malatya and Siirt Provinces, Turkey, three interesting species for the Turkish fauna were collected. This article aims to describe this material and contribute to our knowledge of water mites distribution in Turkey.

Material and methods

During fieldwork, water mites were collected by hand netting, sorted on the spot from the living material, conserved in Koenike's fluid and dissected as described elsewhere (e.g., Gerecke et al. 2007). The holotype and some paratypes of the new species are deposited in the research collection of the Department of Biology, Fırat University, Elazığ, Turkey, other paratypes are deposited in the Museum of Natural History of Montenegro, Podgorica, Montenegro.

The composition of the material is given as: (males/females/deutonymphs). All measurements are given in micrometers. For a detailed description and discussion of the characteristics of the genus *Atractides* and a detailed methodological introduction, see Gerecke (2003) and Davids et al. (2005). The following abbreviations are used: asl. = above sea level, Ac-1 = first acetabulum, Cx-I = first coxae, dL = dorsal length, H = height, L = length, %L = relative length, I-L-6 = Leg 1, sixth segment (tarsus), mL = medial length, P-1 = palp, first segment, S-1 = large proximal ventral seta at I-L-5, S-2 = large distal ventral seta at I-L-5, Vgl = ventroglandulare, V = ventrale, W = width.

Results

Family Hygrobatidae Koch, 1842
Genus *Hygrobates* Koch, 1837

***Hygrobates* (s. str.) *anatolicus* Esen & Pešić, sp. n.**
http://zoobank.org/AE8FEF58-1CEE-4F5F-BFC7-EFEFBFC71BE6
http://species-id.net/wiki/Hygrobates_anatolicus
Figs 1, 2A–C, F, I

Material examined. Holotype: male, dissected and slide mounted in Hoyer's fluid, Turkey: Kahramanmaraş Province, Çağlayancerit, Göksu stream, 37°44'26"N, 37°22'21"E, 975 m asl., 28.10.2010. Paratypes: 33/49/0, same data as holotype, five males and five females dissected and slide mounted in Hoyer's fluid.

Diagnosis. Integument lineated. P-2 ventral margin straight, distally forming a right angle; P-4 ventral setae at the same level.

Description. General features: Integument lineated, occassionaly lines formed as irregular ridges (Fig. 2C). Posteromedial margin of Cx-I slightly triangular, Cx-IV medial margin nose-like protruding. Acetabula arranged in an obtuse triangle; excretory pore

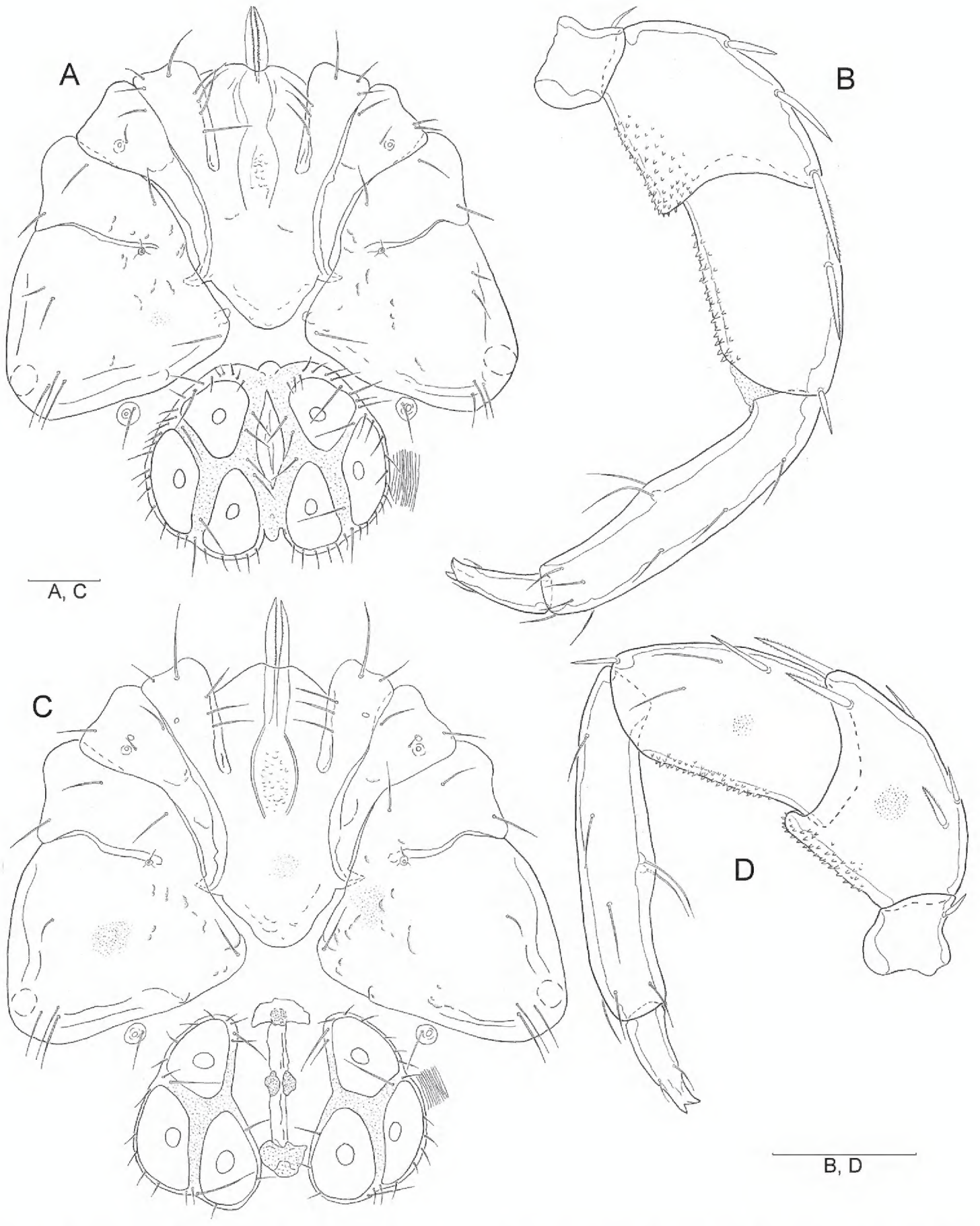

Figure 1. A–D *Hygrobates* (s. str.) *anatolicus* sp. n. (**A–B** male **C–D** female): **A** Coxal and genital field **B** Palp, medial view **C** Coxal and genital field **D** Palp, lateral view (Scale bars = 100 μm).

unsclerotized, distance genital field – excretory pore L in male 110-241, in female 280-351. Palp: P-2 ventral margin straight, distally forming a right angle, denticles covering two-thirds of the ventral margin of both P-2 and P-3; P-4 ventral setae on the same level.

Male (holotype, in parentheses measurements of paratype, n = 5): Idiosoma L/W 960/810 (720–1115/645–940); coxal field (Fig. 1A) L/W 516/680 (495–612/600–

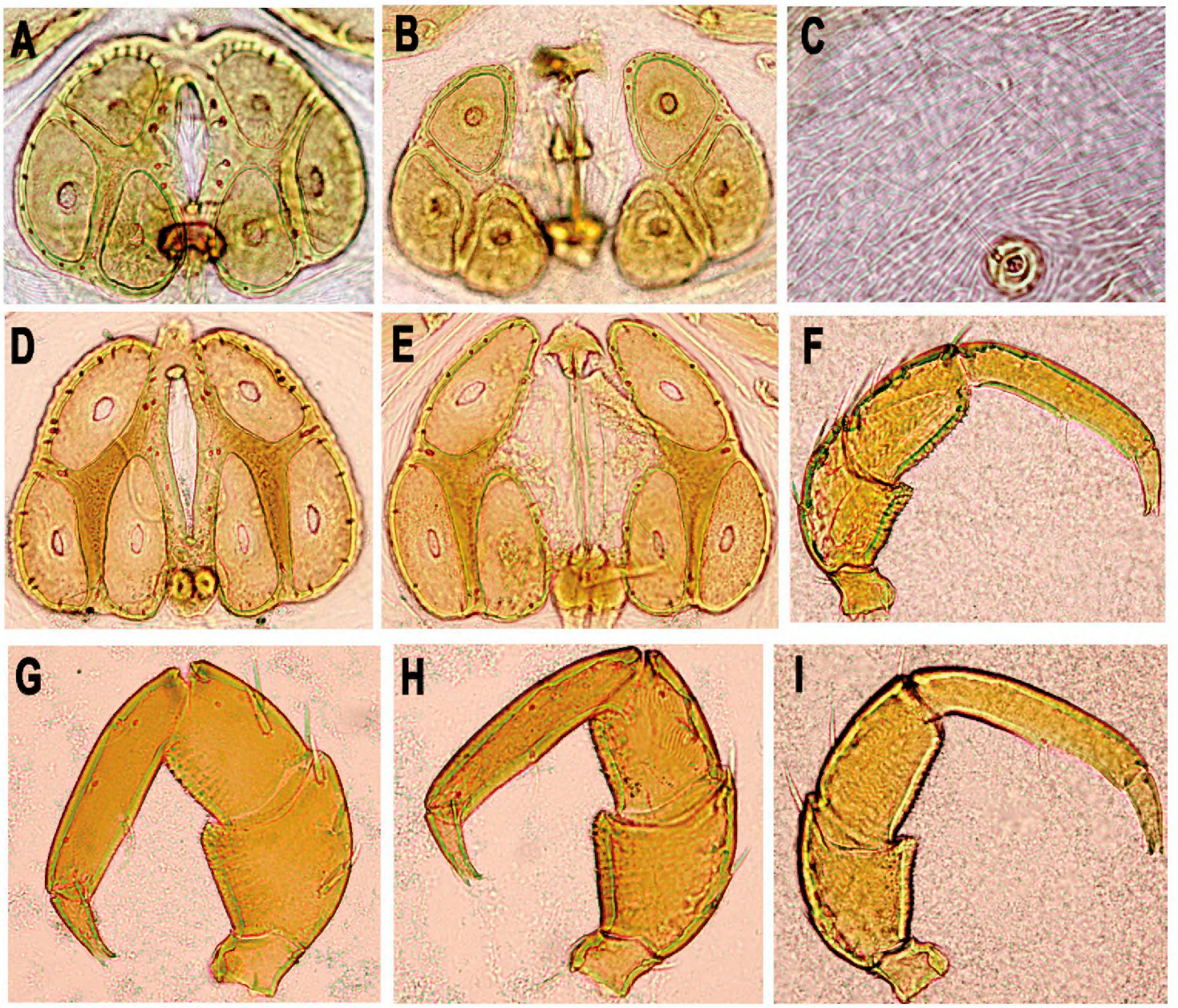

Figure 2. A–C, F, I photographs of *Hygrobates anatolicus* sp. n. (**A, F** male **B–C, I** female), Göksu stream, Turkey **D–E, G–H** photographs of *Hygrobates nigromaculatus* Lebert, 1879 (**D, G** male **E, H** female), Ohrid Lake, Macedonia: **A–B, D–E** genital field **C** detail of dorsal integument **F–I** palp.

745), median length of Cx-I + gnathosoma 395 (380–450); genital plate (Figs 1A, 2A) L/W 261/340 (210–285/315–380), gonopore L 137 (108–130), L Ac-1–3: 107 (102–112), 145 (140–150), 121 (115–125); anterior margin with a small, knob-shaped medial projection, posterior margin indented, with a short, rounded medial projection. Distance between genital field and excretory pore L 200 (110–241). Palp (Fig. 1B, 2F) total L 621 (586–665), dL: P-1, 40 (36–48); P-2, 157 (146–170); P-3, 136 (128–140); P-4, 218 (208–235); P-5, 70 (68–72). Chelicera L 487 (440–496), claw L 170 (157–172). Legs: dL of I-L-4–6: 257 (250–270), 266 (258–275), 243 (235–258); dL of IV-L-4–6: 391 (365–410), 397 (382–422), 346 (325–368).

Female (n = 5): Idiosoma L/W 720–1507/540–1250; coxal field (Fig. 1C) L/W 495–610/550–847; median length of Cx-I + gnathosoma 400–460. Palp (Figs 1D, 2I) total L 668–749, dL: P-1, 47–51; P-2, 160–198; P-3, 144–160; P-4, 241–262; P-5, 78–80. Chelicera L 490–548, claw L 170–190. Genital field (Fig. 1C, 2B) W 330–418, genital plate L 230–268, genital opening L 210–280, L Ac-1–3: 110–120,

145–150, 126–130. Legs: dL of I-L-4–6 285–302, 295–310, 267–286; dL of IV-L-4–6: 430–456, 440–460, 361–385.

Discussion. Due to the shape of palp with a straight ventral margin of P-2, distally forming a right angle, the new species closely resembles *Hygrobates* (s. str.) *nigromaculatus* Lebert, 1879 (Fig. 2D–E, G–H) and *H. setosus* Besseling, 1942. The later species, for a long time was considered a morphotype of *H. nigromaculatus* (Viets 1960), but differs in size (median length of Cx-I + gnathosoma > 350 μm. Males: P-4 length > 140, genital plate length > 170 μm. Females: P-4 length > 165, genital plate length > 175 μm), life cycle with larvae parasitic on chironomid Diptera and habitat preference for running waters (Martin et al. 2010). The larger dimensions and habitat preference for running waters makes the new species close to *H. setosus*. However, presence of lineated integument will easily distinguished *Hygrobates anatolicus* sp. n. from two above-mentioned species bearing finely striated integument.

Remarks. Due to the shape of the genital field, population from Göksu stream resembles populations of *Hygrobates nigromaculatus* and *H. setosus* from the Northern Germany (P. Martin pers. communication). However, population of *H. nigromaculatus* from the Ohrid Lake clearly differs in the shape of genital field (see Figs 2D-E), with the acetabula distinctly elongated, similar to those in *H. longiporus* Thor, 1898. The similar, *longiporus*-shape of the acetabula was recently detected in the population of *H. nigromaculatus* from Luxembourg (R. Gerecke pers. communication), suggesting that this character, in the *H. nigromaculatus* like-species complex, vary and can not be used in taxonomical separation. If possible the species should be included in a possibly molecular and morphological revision of the *H. nigromaculatus* like-species complex.

Etymology. Named after the country of the type locality.

Habitat. Rhithrobiont.

Distribution. Known only from the type locality in Kahramanmaraş Province, Turkey.

Subgenus *Rivobates* Thor, 1897

Hygrobates (*Rivobates*) *diversiporus* Sokolow, 1927

http://species-id.net/wiki/Hygrobates_diversiporus

Figs 3, 4

Material examined. Turkey, Malatya Province, Doğanşehir, Avcapınar stream, 38°00'38"N, 37°57'56"E, 1335 m asl., 04.07.2004, (7/24/0).

Compared material. Senckenberg Museum Frankfurt, Germany, *Hygrobates* (*Decabates*) *quanaticola,* holotype, ♂, P.J/15, Locality. Quanat near Rezazeh, 29.9.1974 coll. Schwoerbel; präp. J/14, *Hygrobates (Decabates) quanaticola,* ♀, Quanat near Rezazeh, 29.9.1974, Schwoerbel.

Morphology. General characters. Posteromedial margin of Cx-I convexly rounded, medial margin of Cx-IV rounded; genital field with 8–13 pairs of acetabula.

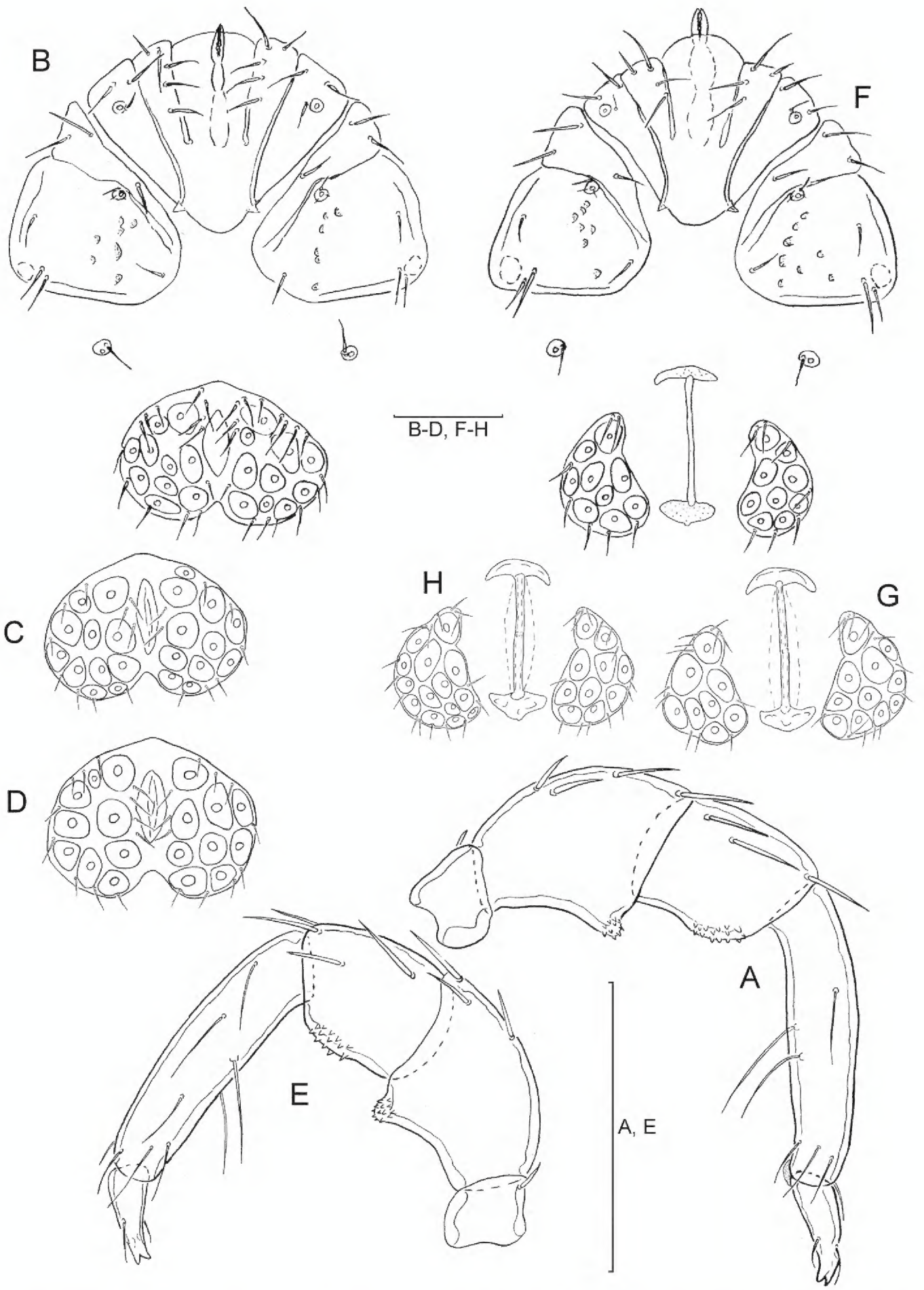

Figure 3. A–H *Hygrobates* (*Rivobates*) *diversiporus* Sokolow, 1927 (**A–D** male **E–H** female): **A** Palp, medial view **B, F** Coxal and genital field **C–D, G–H** Genital field **E** Palp, lateral view (Scale bars = 100 μm).

Ventral margin P-2 proximally concave, distally protruding in a nose- or knob-shaped projection bearing denticles, distal part of P-3 ventral margin covered by denticles, P-4 ventral setae distance 14–19 μm.

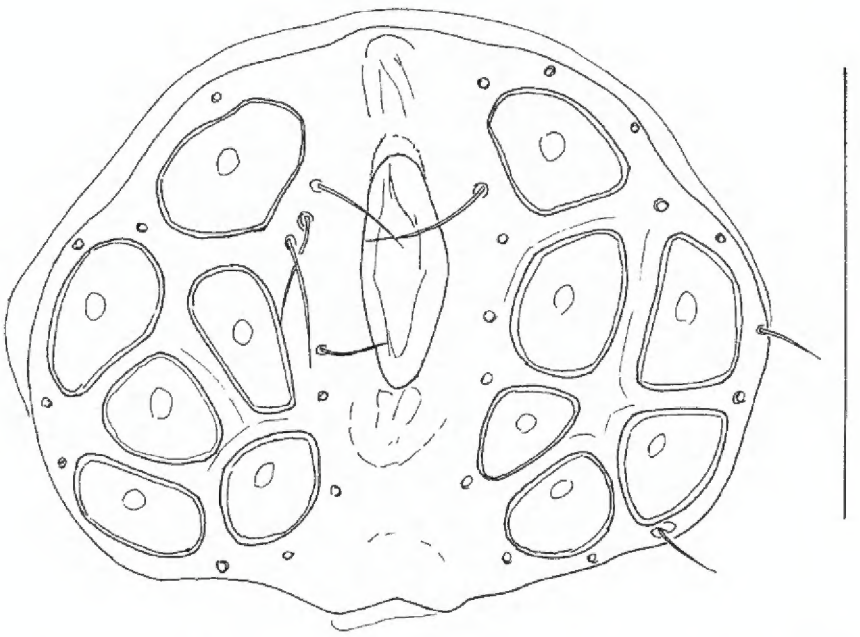

Figure 4. *Hygrobates quanaticola* Schwoerbel & Sepasgozarian, 1976, male holotype: genital field (Scale bar = 100 μm).

Male (n =3): Idiosoma L 805–890 W 690–783; median length of Cx-I + gnathosoma 232–240. Genital field (Figs 3B–D) L 188–191, W 242–273, posterior margin strongly indented. Gonopore L 88–90, distance between genital field and excretory pore 72–100. Palp (Fig. 3A): total L 366–388, dL: P-1, 30–32; P-2, 96–104; P-3, 69–70; P-4, 130–140; P-5, 41–42; chelicera L 210–225.

Female (n =5): Idiosoma L 815–1058 W 670–910; median length of Cx-I + gnathosoma 243–248; genital plate (Figs 3F–H) L 167–180, W 100–104. Distance between genital field and excretory pore L 83–110, genital opening L 200–250, maximum diameter of egg 170. Palp (Fig. 3E): total L 374, dL: P-1, 32–35; P-2, 100–103; P-3, 70–72, P-4, 140–142; P-5 43–45; chelicera L 225–247.

Remarks. Sokolow (1927) described *Hygrobates diversiporus* based on one male and one female specimen from a first order stream in Caucasus. Later on this species has been reported by Bader (1955) from the Ohrid Lake in Macedonia. The latter record of this probably rithrobiontic species from a lacustrine habitat, require confirmation for a better understanding of its geographical distribution. The specimens from Turkey agree well with the type specimen in the shape of male genital field orginally desribed by Sokolow (1927) in German as reverse heart-shaped ("verkehrt-herzförmig"), with an acute anterior angle and a indented posterior margin having a broad, rounded median notch.

The second member of subgenus *Rivobates* Thor known from Turkey, *Hygrobates quanaticola* Schwoerbel & Sepasgozarian, 1976, has been orginally described from Iran (Schwoerbel and Sepasgozarian 1976), and later on reported from Kayseri, Elazığ and Afyon provinces in Turkey (Erman et al. 2010). This species differs (based on re-examination of the holotype) from *H. diversiporus* in the shape of male genital field with irregularly convex posterior margin (compare Figures 3B–D and 4).

Habitat. Rhithrobiont.

Distribution. Russia (Caucasus). New for Turkey.

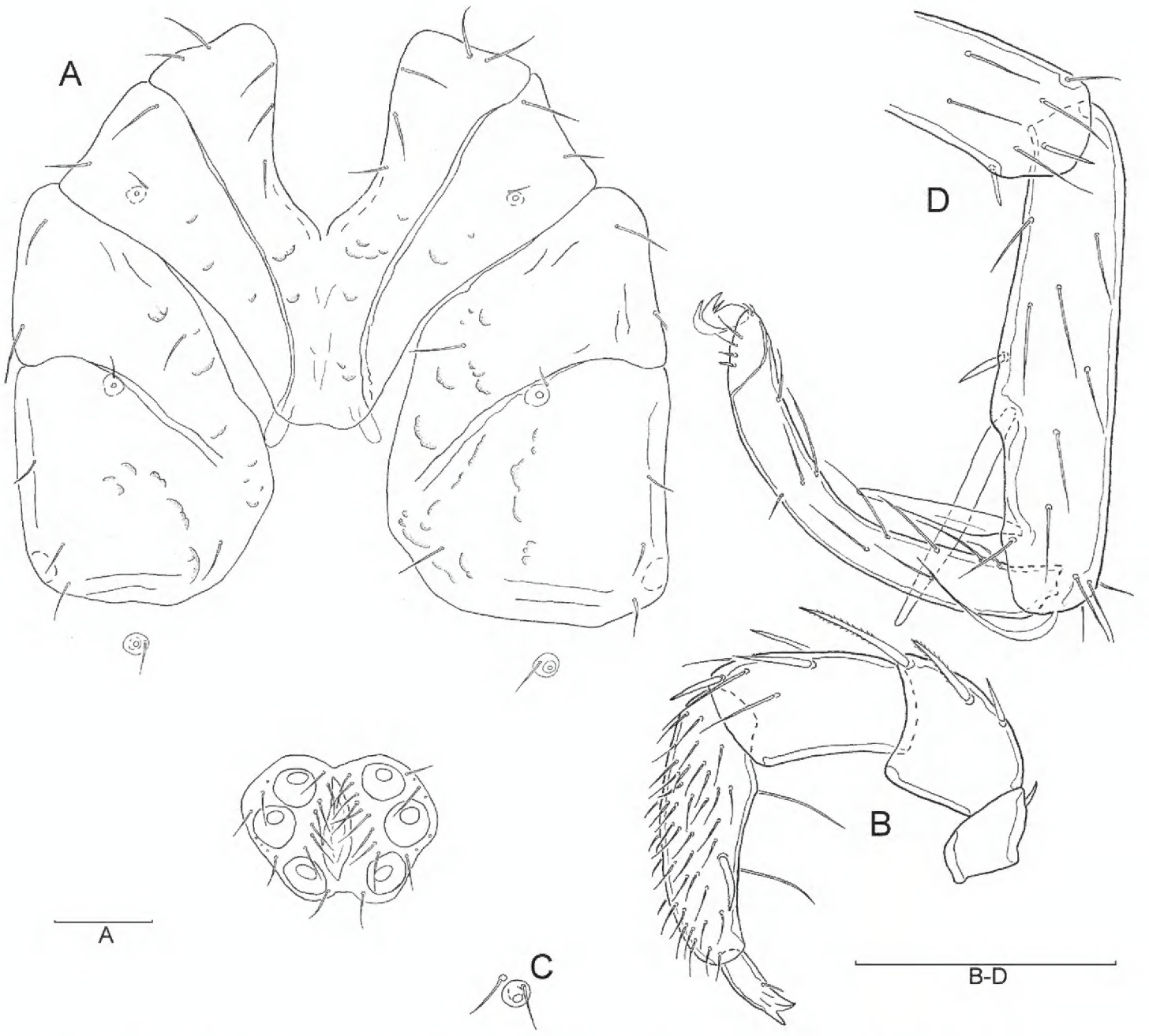

Figure 5. A–D *Atractides* (s. str.) *nikooae* Pešić, 2004, male: **A** Coxal and genital field **B** Palp, medial veiw **C** Vgl-1–2 **D** I–L-5–6 (Scale bars = 100 μm).

Genus *Atractides* Koch, 1837

Atractides (s. str.) *nikooae* Pešić, 2004

http://species-id.net/wiki/Atractides_nikooae

Figs 5, 6

Material examined. Siirt Province, Kezer stream, 37°57'42"N, 41°51'25"E, 545 m asl., 16.09.2012, (4/8/0); Başur stream, 37°57'42"N, 41°47'19"E, 525 m asl., 15.09.2012, (0/2/0).

Morphology. General features. Integument dorsally finely striated; muscle attachment plates unsclerotized. Coxal field: mediocaudal margin of Cx-I+II with a slightly concave or convex area between the laterally directed apodemes of Cx-II. Palp: weak sexual dimorphism, P-2 and P-3 ventral margin straight; P-4 with maximum height near proximoventral hair, sword seta near distoventral hair, ventral margin divided by hair insertions 1:1:1. Genital field with Ac in a weakly curved line; excretory pore smooth; Vgl-

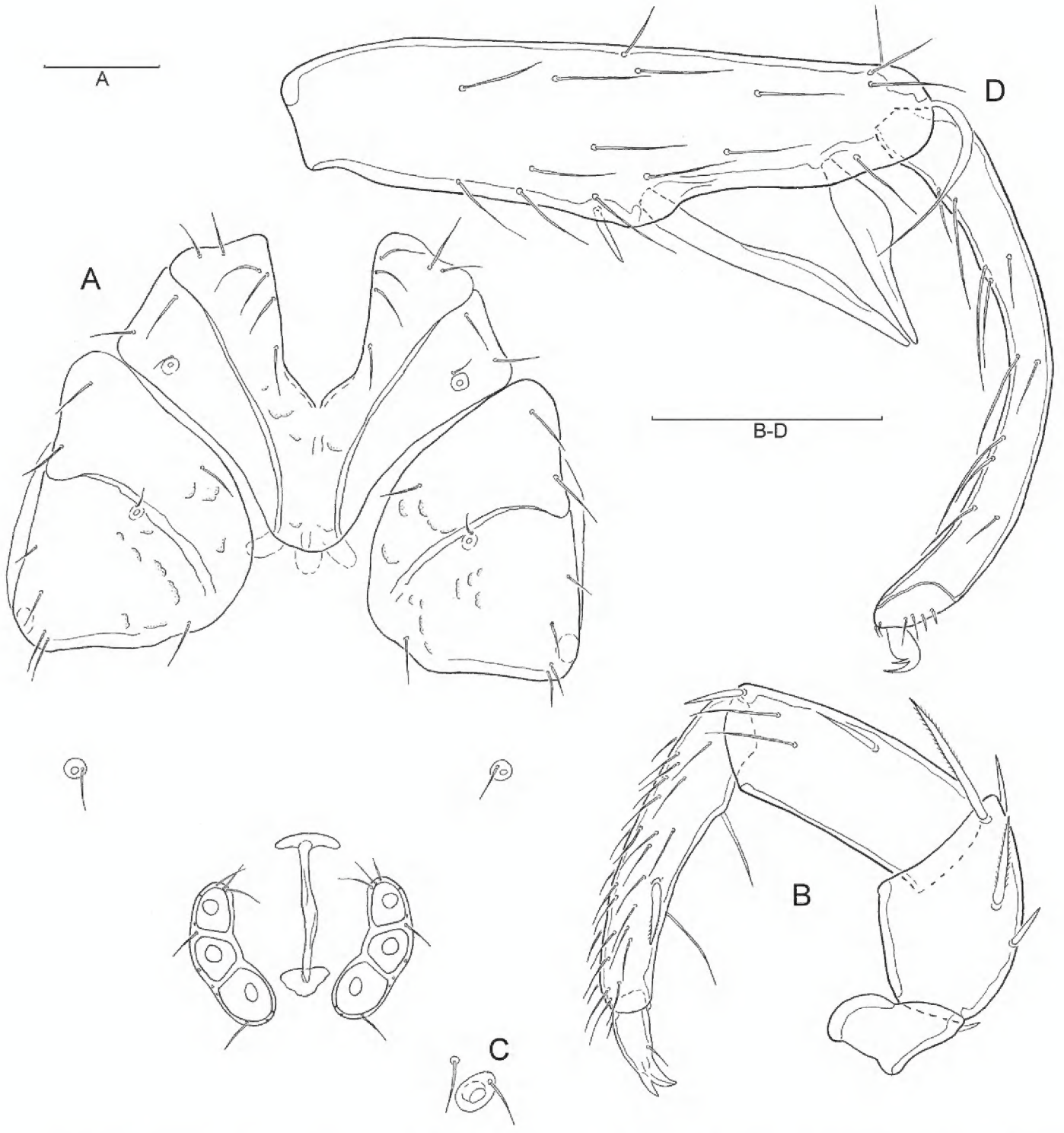

Figure 6. A–D *Atractides* (s. str.) *nikooae* Pešić, 2004, female: **A** Coxal and genital field **B** Palp, medial veiw **C** Vgl-1–2 **D** I–L-5–6 (Scale bars = 100 μm).

1 separate from Vgl-2. I-L-5: S-1 and -2 strongly heteromorphic and widely distanced, S-2 strongly thickened in the basal third; I-L-6 strongly curved, basally thickened.

Male (n = 2). Idiosoma L 470–527 W 420–432. Coxal field (Fig. 5A) L 320–311, Cx-III W 340–360, Cx-I+II medial suture line L 105–108. Palp (Fig. 5B) total L 285–296, dL and %L (in parentheses): P-1, 26–28 (9.0–9.5); P-2, 64–67 (22.2–22.6); P-3, 68–70 (23.6–23.7); P-4, 97–100 (33.8); P-5, 30–31 (10.5); chelicera L 170–187. Genital field apple shaped, L 90–92, W 100, anterior and posterior margin with shallow indentations (Fig. 5A). Legs: I-L-5 dL 192–193, vL 110–113, H 45–47; S-1 L 95, S-2 L 66–68; S-1–2 interspace 40–42; I-L-6 L 160–165, H 22–23; dL ratio I-L-5/6 1.2.

Female (n = 5). Idiosoma L 745–760 W 640–652. Coxal field (Fig. 6A) L 382–421, Cx-III W 465–480, Cx-I+II mL 135–142. Palp (Fig. 6B) total 417–445, dL and

%L (in parentheses): P-1, 38–40 (9.0); P-2, 90–100 (22.1); P-3, 107–116 (30.0); P-4, 142–148 (33.4); P-5, 40–41 (9.5); P-4 more slender than in male; chelicera L 208. Genital field W 180–204, genital plate L 110–121. Legs: I-L-5 dL 263–280, vL 140–148, H 70–76; S-1 L 128–138, S-2 L 72–88, W 20–21 (ratio 3.6–4.2), ratio L S-1/2 1.78–1.57, S-1–2 interspace 70–72; I-L-6 L 217–230, H 28–30; dL ratio I-L-5/6 1.2.

Remarks. Due to the similar morphology of the genital field (relatively small Ac arranged in a weakly curved line, male genital field apple-shaped with anterior an posterior margin slightly indented), I-L-5 and -6 (S-1 and S-2 with relatively wide setal interspace, I-L-6 strongly curved and slender) and palp (without sexual dimorphism, P-2 ventral margin straight in the both sexes), the specimens from Turkey shows conformity with *Atractides nikooae* Pešić, 2004, a species known from both sexes from the Markazi Province (western Iran, Pešić et al. 2004).

Atractides (s. str.) *diastema* (Szalay, 1935), a weakly defined species from Hungary and Poland, known only from a female sex, differs from *A. nikooae* (in parentheses data taken from Gerecke 2003) in a weakly S-shaped ventral margin of P-2, ventral margin P-4 divided by hair insertions in sections 2:2:1, more stouter palp segments (L/H P-3 2.77, P-4 4.2), and a less heteromorphic setae S-1/2 (L S-1/2 1.3).

Habitat. Rhithrobiont.

Distribution. Iran (Pešić et al. 2004). New for Turkey.

Acknowledgements

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